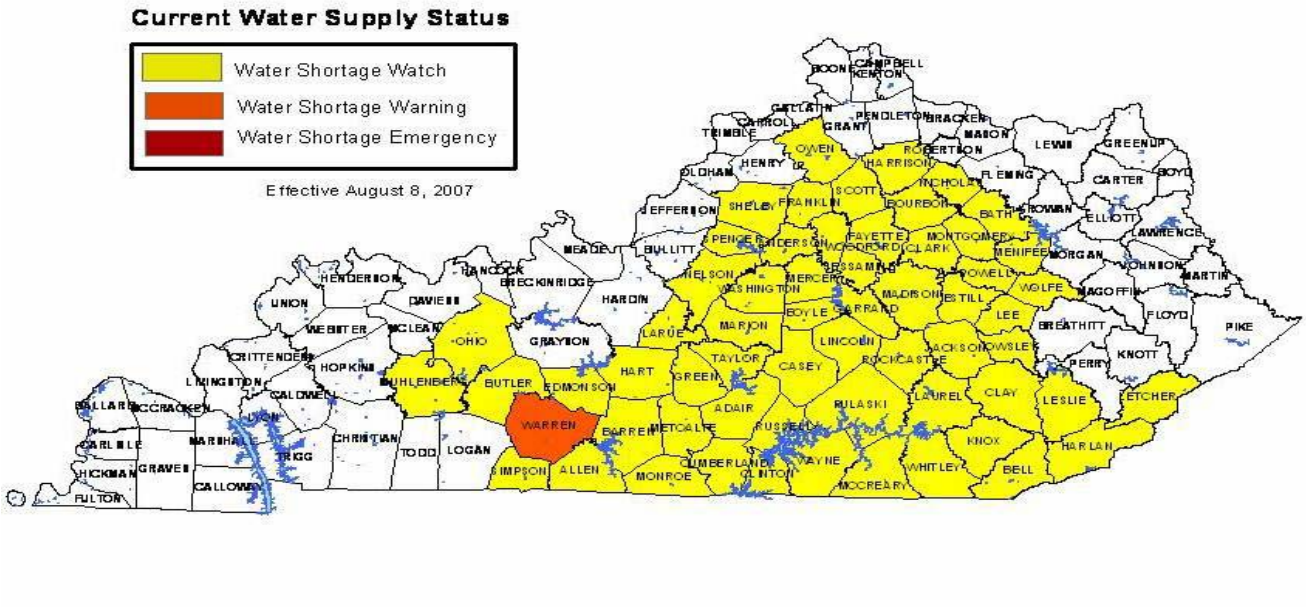
Drought

The Kentucky Division of Water continuously monitors hydrologic conditions throughout the state, including precipitation, streamflows, lake elevations and various drought indices. This information is used to detect emerging drought conditions, to identify the locations and severity of drought and to provide timely and appropriate public notification.

Kentucky Drought Monitoring Center



UPDATE Aug. 9, 2007 - State Places Warren County on Water

Shortage Warning (To view press release please click here.)

Water Shortage Notification System Explained

Statewide Summary of Drought Development

Updated Aug. 17, 2007

Drought conditions across Kentucky continue to intensify with persistent high temperatures and rainfall deficits. A relatively rapid onset of intense drought conditions in the first two weeks of August has moved the entire state into severe drought status with a portion of southeastern Kentucky in extreme drought. With rainfall deficits as high as 16 inches in parts of eastern and western Kentucky expect drought conditions to persist, with periodic but very localized relief from scattered showers and thunderstorms for at least the next seven to 10 days.

It is important for Kentuckians to remain aware of the conditions that can lead to water shortages. High temperatures can encourage high demands, mostly in the form of outdoor water use. Some cities may see increased demand as children return to school or as colleges and universities resume classes. It is a good idea for all of us to take the time to consider our individual water use and identify specific actions that can be taken to reduce demand on our local water supplies if asked to do so by local water suppliers.

In the short term, we can expect a continued pattern of higher-than-normal temperatures and below-normal rainfall. These conditions will increase the chances for customer demand to create problems for water suppliers. This type of water shortage situation can be managed if all customers heed the requests made by their water supplier to reduce demand. Typically, a 10 to 15 percent reduction in water use is a reasonable goal for individuals to try and achieve under a water shortage advisory declared by a local water supplier.

Useful Drought Indicators

PRECIPITATION

Precipitation for the past 30 days in the Eastern, Bluegrass and Central climatic divisions averaged 77 percent of normal while the Western climatic division received an average of only 45 percent of normal.

STREAMFLOWS

Effects from the previous month's precipitation have diminished and August streamflows across most of the state are in steady decline. All river basins contain streams that are experiencing flows categorized by the United States Geological Survey as "much below normal" (less than a 10 percentile for the period of record).

LAKE ELEVATIONS

While most small water-supply lakes are not abnormally low, they continue to decline under the stress of high temperatures and lack of precipitation. Increased customer demand has forced a number of these water systems to call for conservation measures. Lakes under the control of the Huntington District, Louisville District and Nashville District of the U.S. Army Corps of Engineers continue to operate along their normal lake elevation curves. Two exceptions are the Barren River Reservoir in Barren County and Rough River reservoir in Breckinridge County. Barren River reservoir is having difficulty bringing the elevation to normal pool and is currently down by 3.8 feet. Discharges from the dam have been at or near the minimum release most of the time since Mar. 20, 2007. Releases from Corps of Engineers reservoirs are important to the status of many Kentucky rivers as sources of supply for drinking water, assimilation of wastewater discharges, water quality and aquatic habitat. These rivers include the Green, Barren, Rough, Nolin, Kentucky, Salt, Licking and Big Sandy rivers.

DROUGHT INDICES

Assessing the severity of a drought is made easier with the use of drought indices that combine various source information into a single representative value of drought severity. The Palmer Drought Severity Index uses data for precipitation, temperature and evapotranspiration (the water returned to the atmosphere through the combined actions of evaporation and plant growth) to calculate a number that can be compared across different times and locations. This index was developed in the 1960's in Kansas and Nebraska but has since become a part of drought monitoring in a majority of the United States. The Palmer Drought Severity Index is updated weekly on Monday afternoons.

New Updated Aug. 17, 2007 New

The Palmer Drought Severity Index and the Drought Monitor indicate severe to extreme drought across Kentucky.

The Palmer Drought Severity Index issued on Aug. 13, 2007, places all four climatic divisions in severe drought status.

The Drought Monitor represents a comprehensive assessment of several factors that contribute to the development of drought or that indicate the severity and potential persistence of drought. The Drought Monitor is updated weekly on Thursday mornings.

The most recent Drought Monitor shows a complete coverage of severe drought conditions for the state. Southeastern Kentucky including McCreary, Whitley, Knox, Bell, Harlan and portions of Clay and Leslie counties are designated as experiencing extreme drought conditions.

As a drought indicator, the Drought Monitor is not limited to four large climatic divisions, rather it incorporates the Palmer Index as just one of several indicators of drought development in a given area. These other indicators include more short-term components including the Crop Moisture Index, Standardized Precipitation Index and weekly streamflow percentiles. The Palmer Drought Severity Index and the Drought Monitor should be considered in combination with more localized data such as rainfall, streamflows, groundwater levels and climatic outlooks to form an accurate assessment of drought severity in a given location.

Drought Monitoring

Drought is a natural and recurring feature of our climate that can be considered a "severe" weather event much like a tornado, a flood or a hurricane. However, there are a few key differences that distinguish drought from other weather events that make it difficult to detect, track and respond to drought.

Part of the difficulty in detecting drought is in the lack of an obvious onset of drought conditions. A drought develops slowly and can appear to mimic a normal spell of dry weather in the summer, a time of the year when dry weather is accepted and expected. Short-term rainfall shortages create problems for agricultural crops, livestock, urban landscapes and other activities that depend on stored soil moisture between rainfall events. We are accustomed to dealing with short-term dry spells in part because there is an expectation that rainfall is just around the corner. However, when rainfall shortages persist for weeks or months at a time, activities that depend on long-term storage of water will be adversely impacted as well. Droughts in Kentucky can have serious negative consequences for drinking water supplies, energy production, commercial and industrial operations, recreation and aquatic habitat.

The negative impacts of drought cannot be avoided but there are ways to reduce them to a manageable level. All water suppliers in the commonwealth should have a water shortage response plan to guide both the supplier and customer during a

drought event. It is important for customers to listen to their water suppliers and be ready to take necessary actions to prevent a water shortage problem from developing. This is critical to a successful outcome because the only way to effectively manage the source of water supply is to first manage the demand for water.

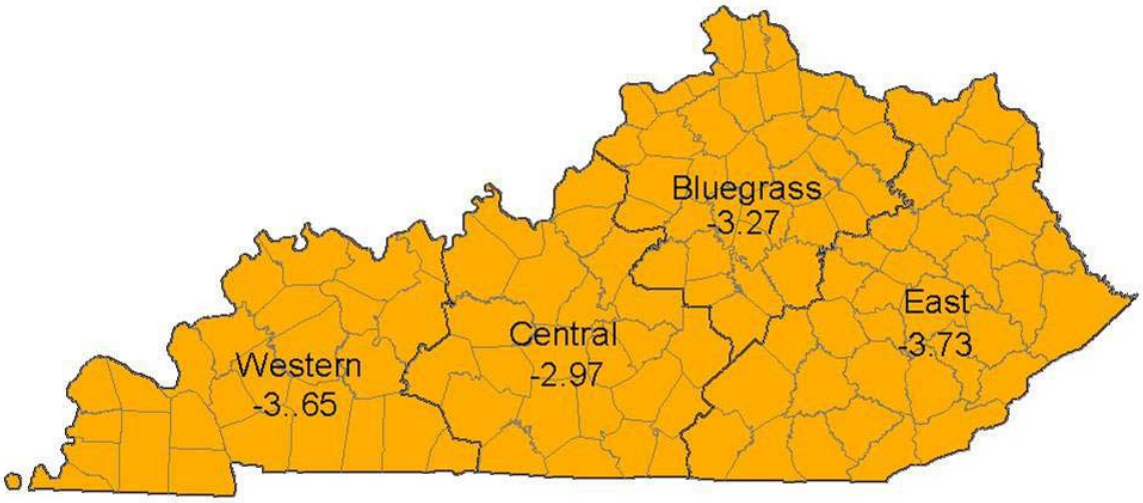
There is no easy method for determining when a dry spell has become a drought, how long a drought will persist or how intense a drought may become. However, by closely tracking certain sources of information, referred to as drought indicators, it is possible to detect potential drought development early enough to allow at least some lead-time for notification and initiation of drought response preparations at the local level. The Division of Water monitors for the potential development of drought in Kentucky by tracking precipitation, streamflows, lake levels, groundwater and water supplies. There are also several tools that are useful in assessing the severity of a "dry spell" and the potential impacts to agriculture, forest fires, water supplies and other vulnerabilities to drought. These tools include the Palmer Drought Severity Index, the Drought Monitor, the Standardized Precipitation Index and several others.

The Drought Monitoring pages will be updated on a weekly basis to provide timely information and assessments of current drought conditions in Kentucky. There will also be numerous links to other resources and drought information pages from various state and federal agencies.

New Updated Aug. 17, 2007 New

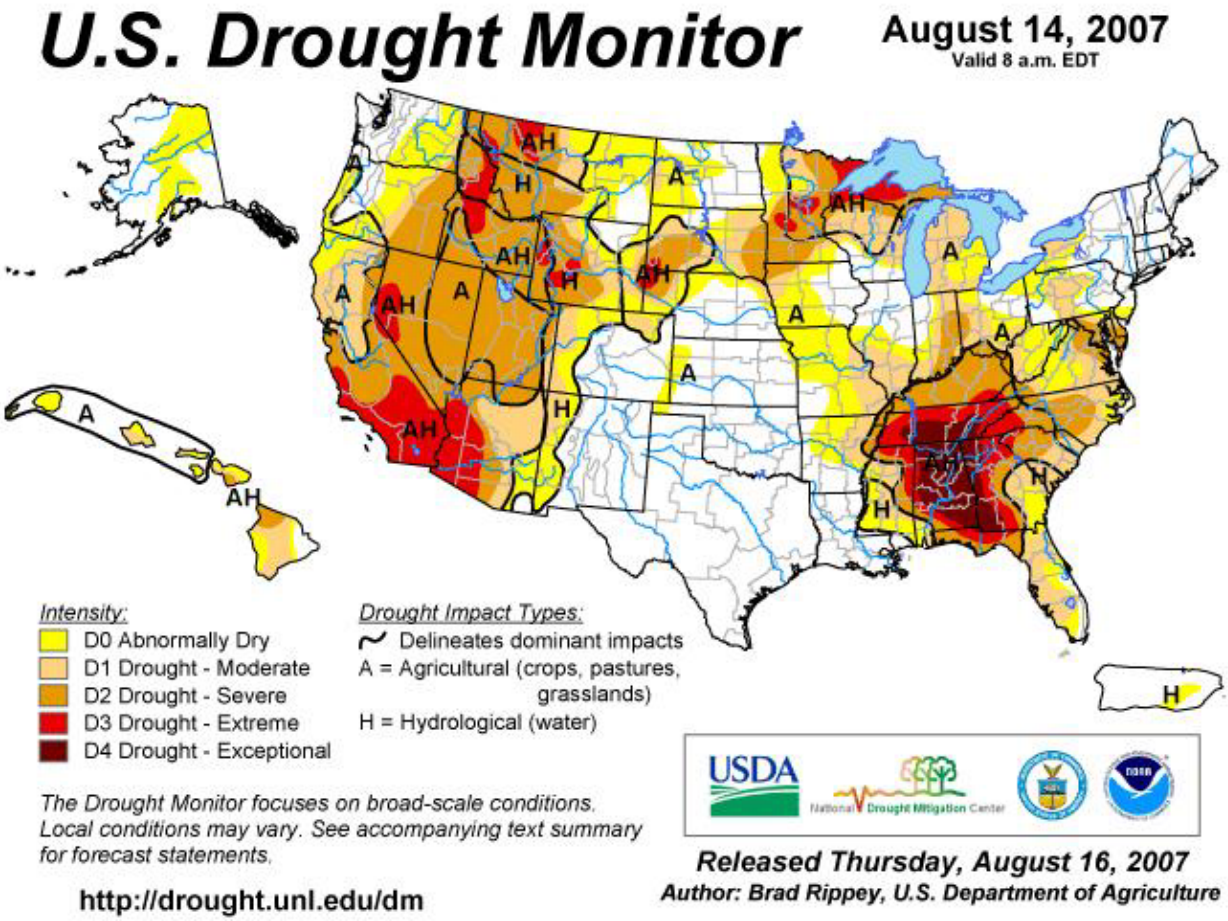
Palmer Drought Severity Index The Palmer Drought Severity Index (PDSI) is compiled weekly by the Central Region Climate Prediction Center (National Centers for Environmental Prediction, National Weather Service and National Oceanic and Atmosphere Administration) and provided on the University of Kentucky Agricultural Weather Center's Web site. This index is useful for placing a developing drought into context with past droughts and serves as a measure of current conditions. The index also provides a standardized assessment of developing drought conditions that can be compared between different areas of the state or even between different states.

PDSI values can be categorized as follows:



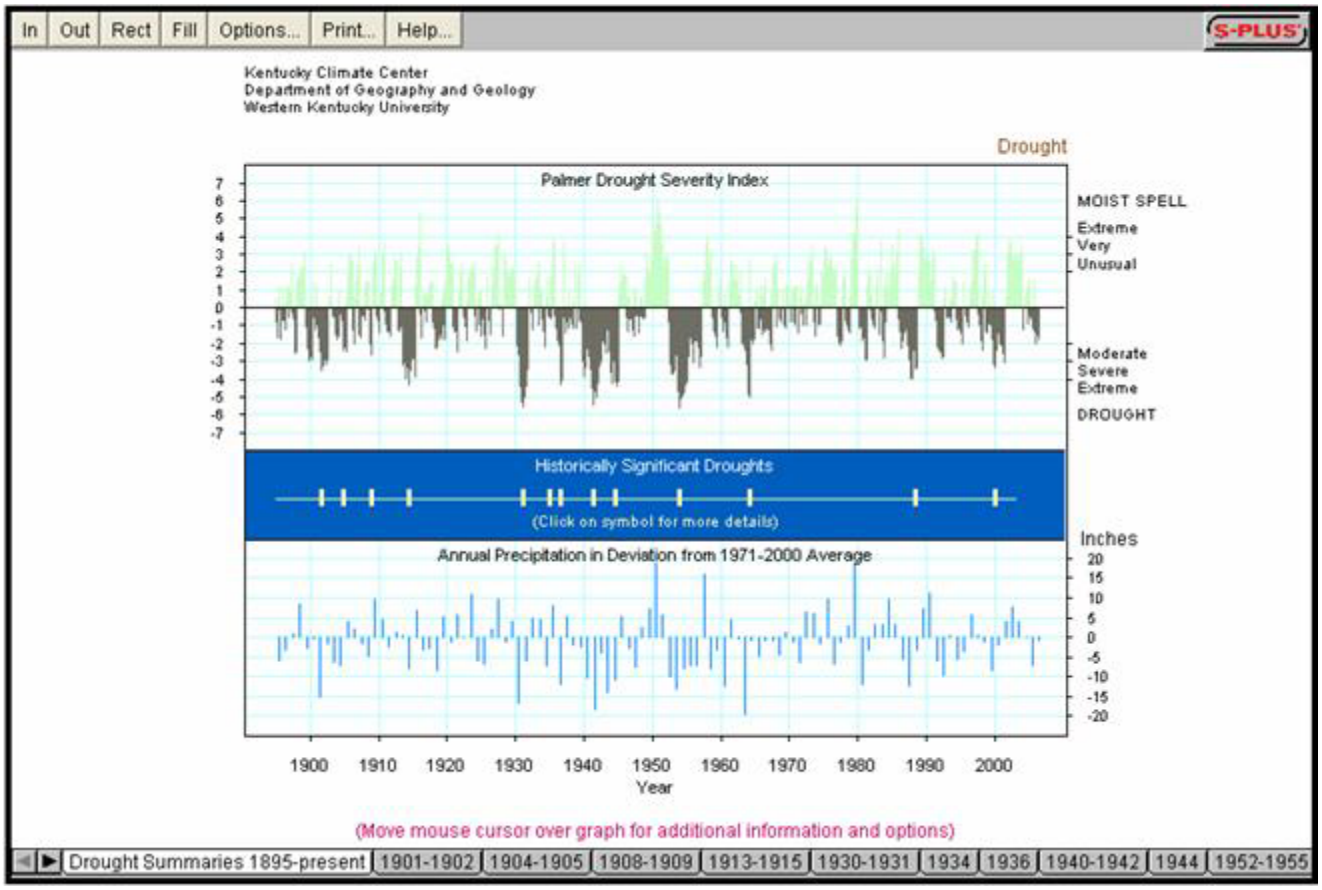
- 0 to -0.99 = near normal
- -1.00 to -1.99 = mild drought
- -2.00 to -2.99 = moderate drought
- -3.00 to -3.99 = severe drought
- -4.00 and below = extreme drought

The Drought Monitor



Tracking drought blends science and art. No single definition of drought works for all circumstances, so people rely on drought indices to detect and measure droughts. But no single index works under all circumstances, either. The Drought Monitor is a synthesis of multiple indices, outlooks and news accounts, that represents a consensus of federal and academic scientists. A detailed description of the parameters used to create the Drought Monitor can be found here.

Kentucky Climate Center Historical Drought Data



Interactive graphs displaying drought indices since 1895 for Kentucky's four climate divisions. Users can identify and explore the development of historically significant droughts.

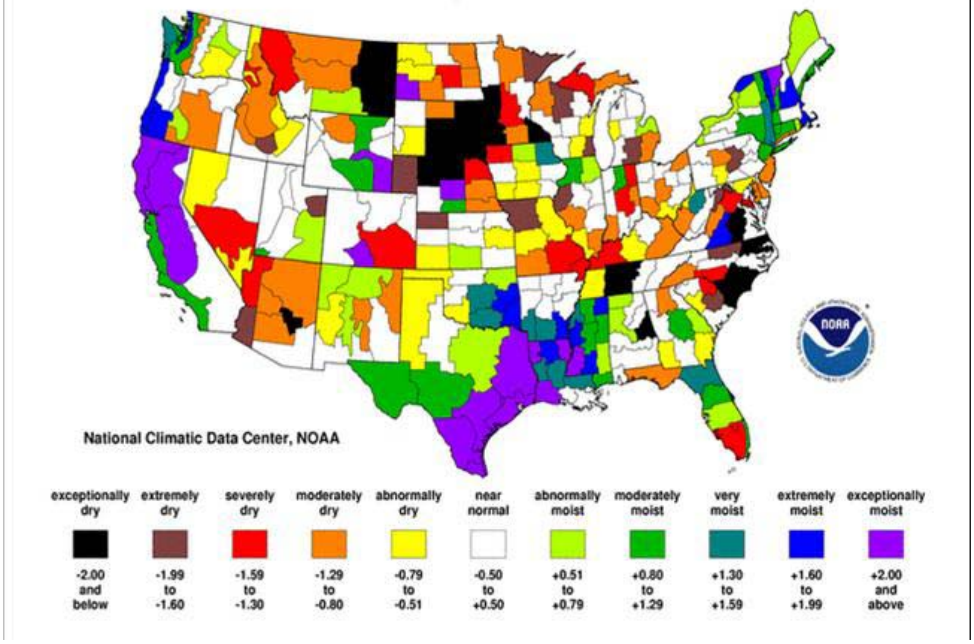
Examining the past can be a useful tool in interpreting the significance of a developing drought situation. Comparisons of the current drought to the historical record provide a frame of reference for evaluating how serious the current drought has become, and how it might develop in the coming months. One of the best tools to evaluate past droughts is found at the Kentucky Climate Center at Western Kentucky University. Click on the figure at the left to visit this site and learn more about the history of drought in Kentucky.

The Standardized Precipitation Index

The Standardized Precipitation Index (SPI) is a way of measuring drought that is different from the PDSI. Like the PDSI, this index is negative for drought and positive for wet conditions. But the SPI is a probability index that considers only precipitation, while Palmer's indices are water balance indices that consider water supply (precipitation), demand (evapotranspiration) and loss (runoff).

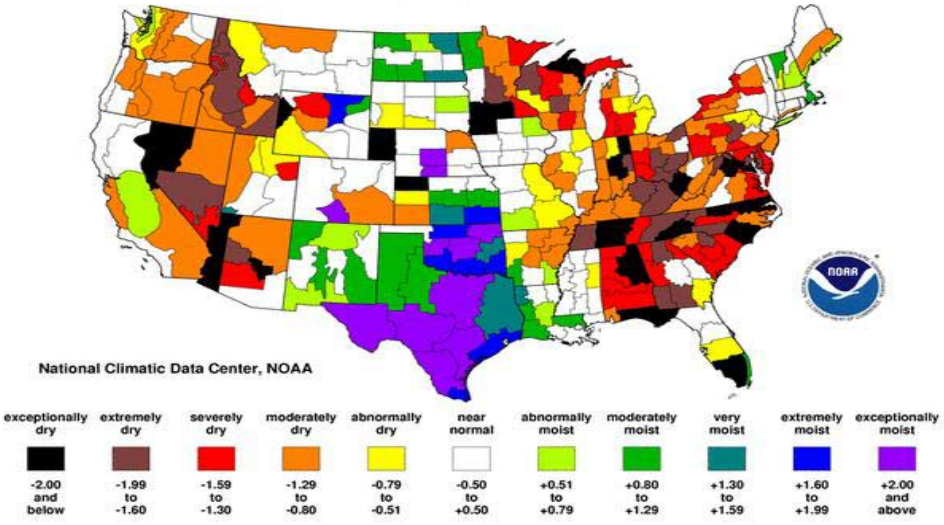
Standardized Precipitation Index
One Month

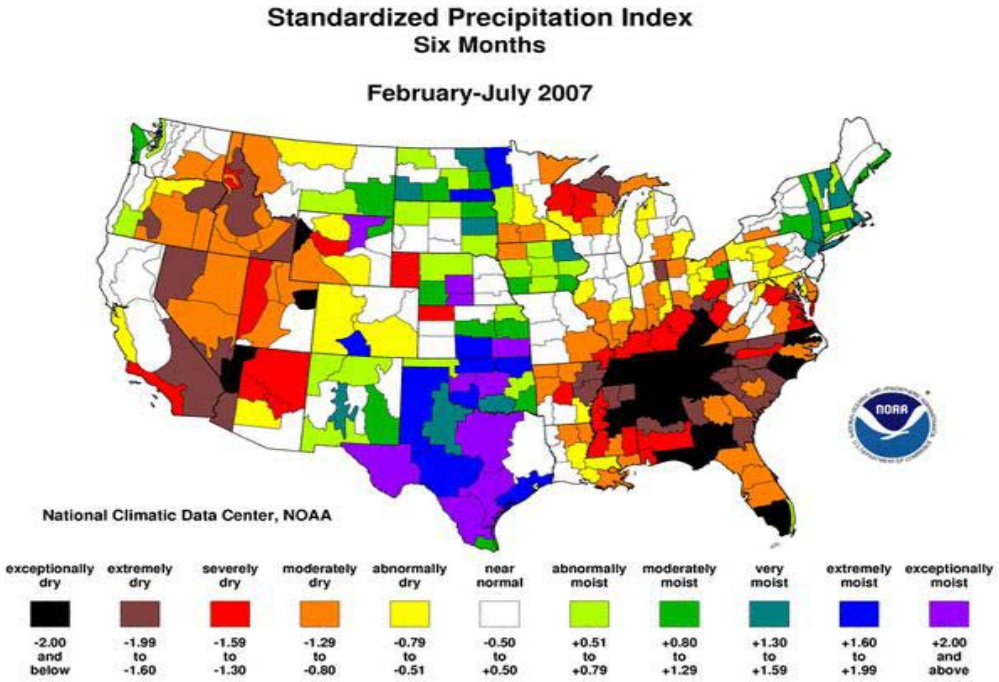
July 2007



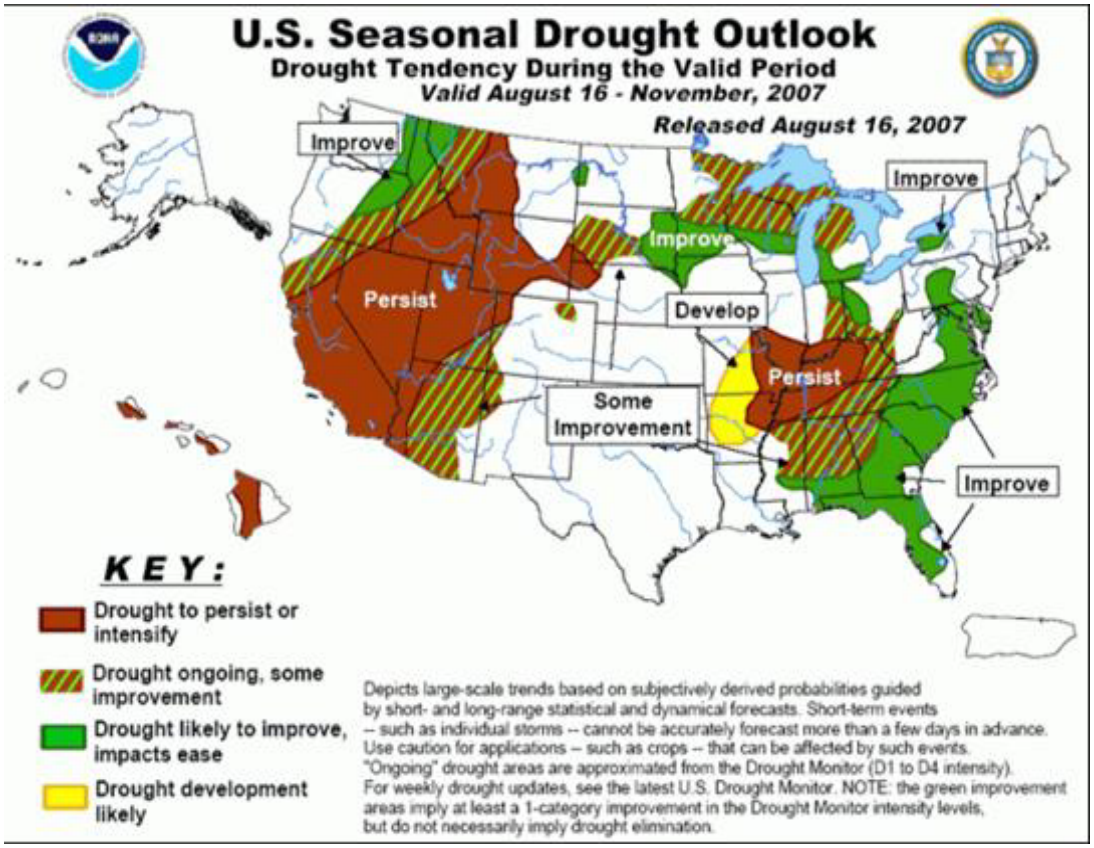
Standardized Precipitation Index
Three Months

May-July 2007





U.S. Seasonal Drought Outlook



The Climate Predication Center issues the U.S. Seasonal Drought Outlook each month in conjunction with the release of the long-lead temperature and precipitation outlooks.

Weather and Climate

PRECIPITATION

The Division of Water monitors a network of 24 daily climate-reporting stations to track developing shortages of precipitation. For the year, precipitation deficits for range from 62 percent of normal in the Eastern climatic division to 79 percent of normal in the Central climatic division. A survey of individual climate stations in each climatic division shows a distinct south to north disparity in precipitation coverage.

New Updated Aug. 17, 2007 New

(Click on images to enlarge)

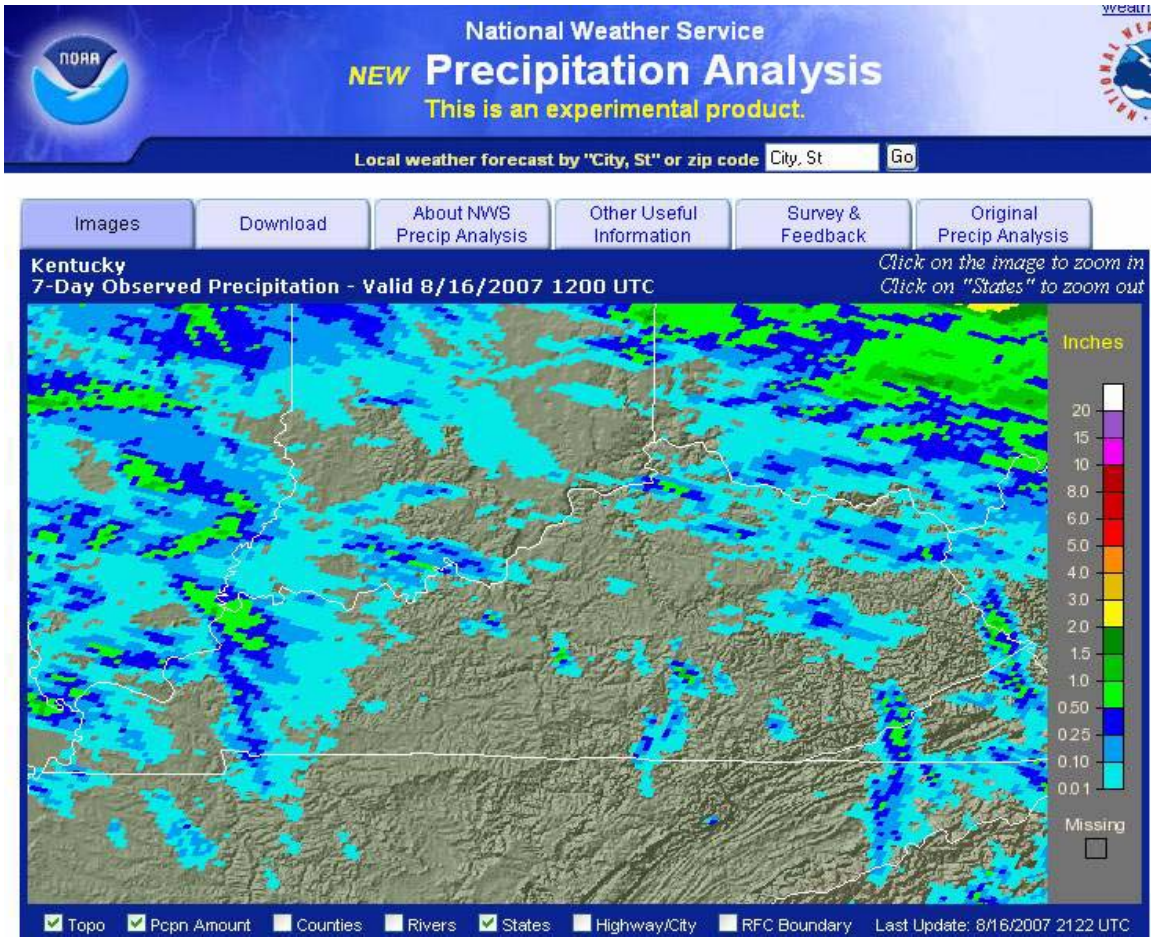
Precipitation: Data for the previous 30/60/90-day period and the Water Year Beginning October 01, 2006

	Water Year		30/60/90 Day Total Precipitation and Departure From Normal					
Station	Precipitation Totals (inches)	Departure From Normal (inches)	30 Day Total (inches)	30 Day Departure (inches)	60 Day Total (inches)	60 Day Departure (inches)	90 Day Total (inches)	90 Day Departure (inches)
Henderson	32.27	1.35	1.29	-3.28	5.88	-2.85	9.26	-4.06
Paducah	33.68	-1.04	2.32	-2.63	5.75	-4.04	8.72	-5.87
Princeton	30.11	-6.18	2.05	-2.88	5.96	-3.64	8.32	-6.07
Mayfield	27.58	-10.52	0.60	-4.16	3.85	-5.93	5.75	-9.21
Louisville	30.34	0.04	1.19	-3.26	6.33	-2.39	9.31	-3.87
Bardstown	27.05	-2.41	0.61	-3.84	5.24	-3.16	8.62	-3.98
Hardinsburg	29.47	-4.05	1.24	-3.48	5.51	-3.58	7.82	-5.70
Campbellsville	29.07	-6.24	1.69	-3.51	7.53	-2.45	11.86	-2.88
Nolin Lake	30.33	-5.12	3.35	-1.90	8.12	-1.79	10.49	-3.60
Glasgow	27.72	-8.33	1.38	-3.63	6.30	-3.32	9.49	-4.98
Bowling Green	25.25	-10.23	2.58	-2.26	6.60	-2.63	7.55	-6.52
Covington	24.60	-3.06	0.92	-3.31	3.46	-4.58	6.07	-6.02
Williamstown	32.10	2.93	1.80	-2.53	5.99	-2.51	12.43	-0.56
Spindletop	21.72	-7.66	1.30	-3.07	4.69	-3.63	7.17	-5.35
Lexington	26.89	-2.48	2.22	-2.14	5.96	-2.35	8.75	-3.76
Dix Dam	24.47	-6.36	1.26	-3.38	5.62	-3.30	9.45	-3.70
Berea	24.11	-6.60	1.49	-3.28	5.69	-3.41	9.30	-3.93
Grayson	24.78	-2.65	1.82	-2.06	5.34	-2.71	8.35	-3.19
Jackson	21.76	-9.63	1.88	-2.52	4.27	-4.27	5.67	-7.06
Quicksand	20.38	-11.12	1.87	-2.65	4.21	-4.45	5.60	-7.24
Buckhorn Lake	18.13	-12.27	0.63	-3.51	3.84	-4.09	6.00	-6.04
London	21.97	-9.18	0.96	-3.29	5.88	-2.32	6.66	-5.77
Somerset	26.75	-7.78	1.30	-3.80	5.31	-4.23	7.63	-6.30
Cumberland Gap	20.80	-14.40	0.30	-4.44	4.62	-4.30	7.75	-5.93

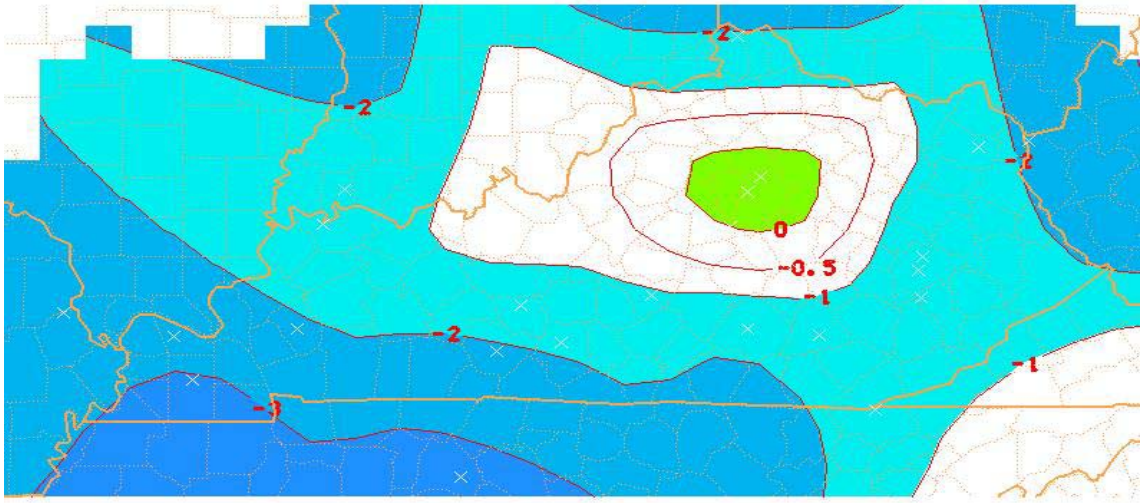
Climatic Division	Normal Precip. Water Year	Normal Precip. Calendar Year	Percent of Normal Precipitation				
			Water Year	Calendar Year	30 Day	60 Day	90 Day
Western (1)	44.15	31.89	83	70	45	68	53
Central (2)	43.76	32.11	83	77	73	85	61
Bluegrass (3)	39.16	29.05	84	78	86	81	65
Eastern (4)	41.78	30.77	68	63	72	69	55

August continues to exhibit a lack of precipitation that is below normal for this typically drier month. Precipitation for the past 30 days in the Eastern, Bluegrass and Central climatic divisions averaged 77 percent of normal while the Western climatic division received an average of only 45 percent of normal.

For the 30-day period ending Aug. 16, 2007, average precipitation amounts of 1 to 5 inches were measured across the Central, Bluegrass and Eastern climatic divisions. Lesser amounts, about 0.5 to 3 inches, were measured across the Western climatic division. Statewide, the combined precipitation for the months of January through July of this year ranked as the sixth driest for the period since at least 1895 -- the first year of the instrumental record.

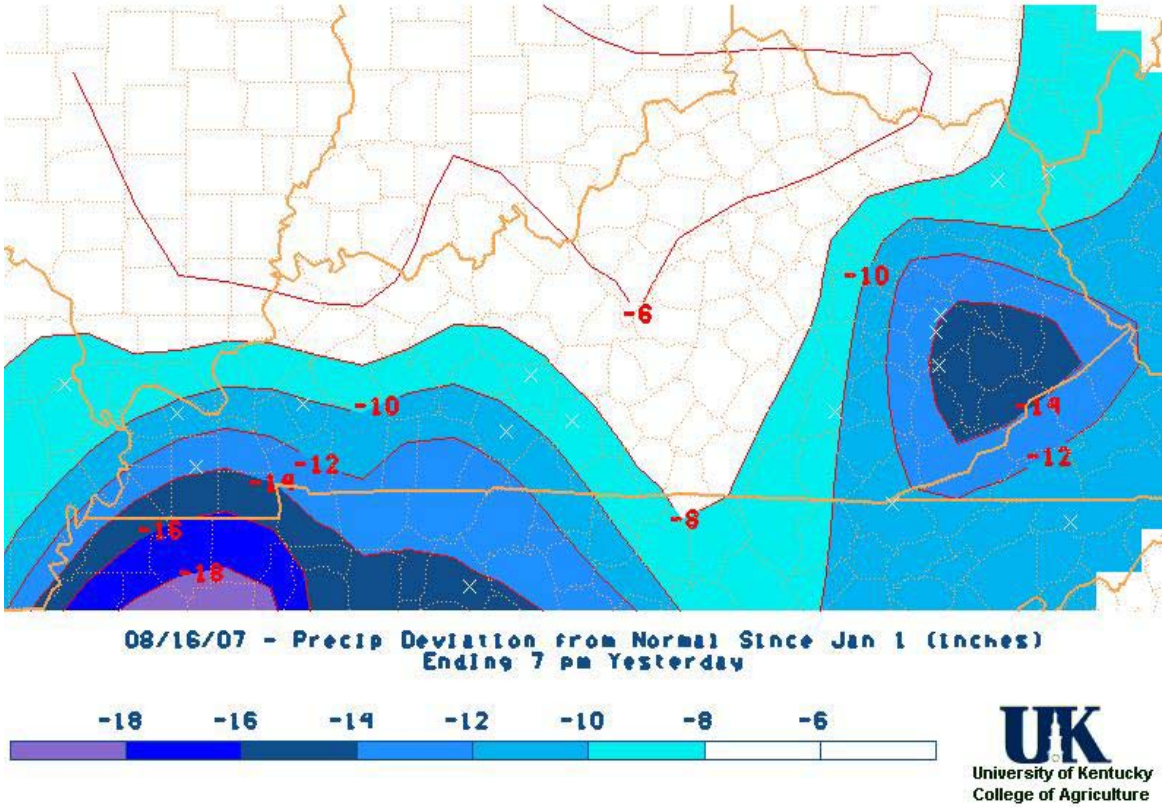


ATTENTION: One of the best tools to assess the amount and distribution of precipitation in Kentucky is the National Weather Service's Precipitation Analysis Product. Data can be displayed for many different time frames and can be selected to show not only the amounts, but also the deficits and percentages of normal for each time frame.

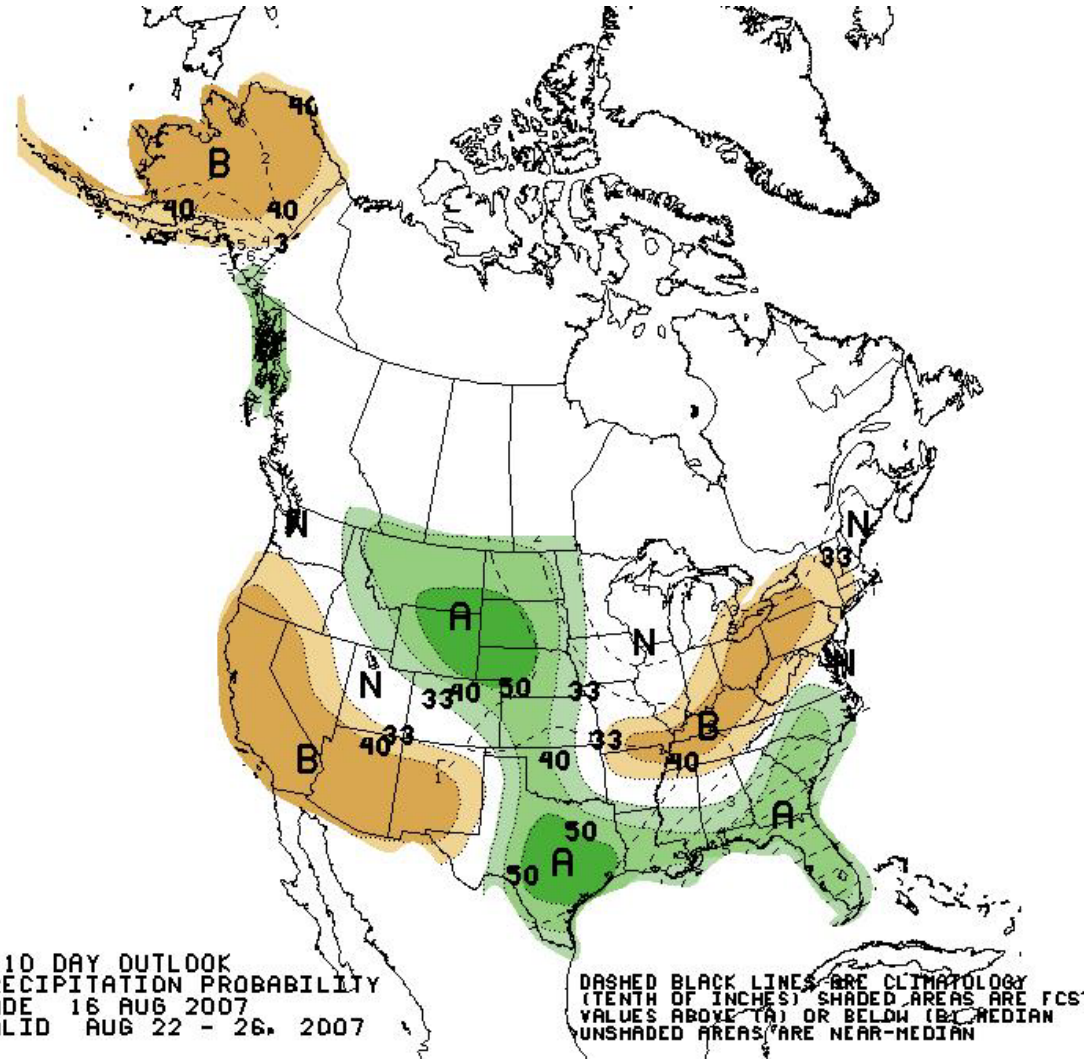


08/16/07 - 30 Day Precip Deviation from Normal (inches)
Ending 7 pm Yesterday

University of Kentucky
College of Agriculture

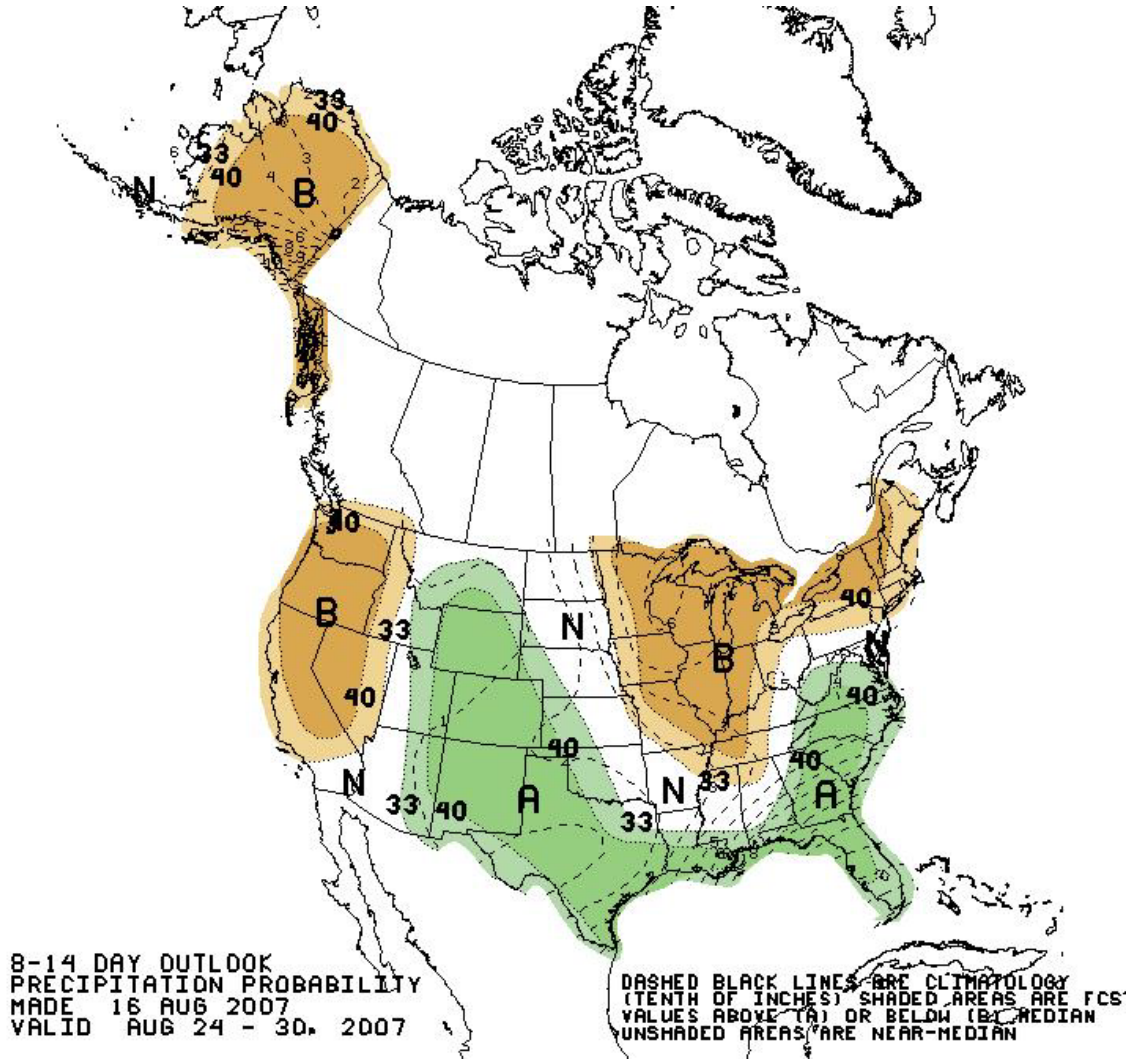


For the year, the largest deficits remain in the southern portions of the Western and Eastern climatic divisions. Eight to 16-inch precipitation deficits have built in parts of the Purchase area of the west and the headwaters of the Kentucky, Licking, Cumberland and Big Sandy river basins in the east. Deficits up to 16 inches persist in an area centered around Knott, Breathitt, Perry and Letcher counties. Central and northern Kentucky deficits range from 4 to 8 inches in the Bluegrass and parts of south-central Kentucky.



6-10 DAY OUTLOOK
PRECIPITATION PROBABILITY
MADE 16 AUG 2007
VALID AUG 22 - 26, 2007

DASHED BLACK LINES ARE CLIMATOLOGY
(TENTH OF INCHES) SHADED AREAS ARE FCS
VALUES ABOVE (A) OR BELOW (B) MEDIAN
UNSHADED AREAS ARE NEAR-MEDIAN

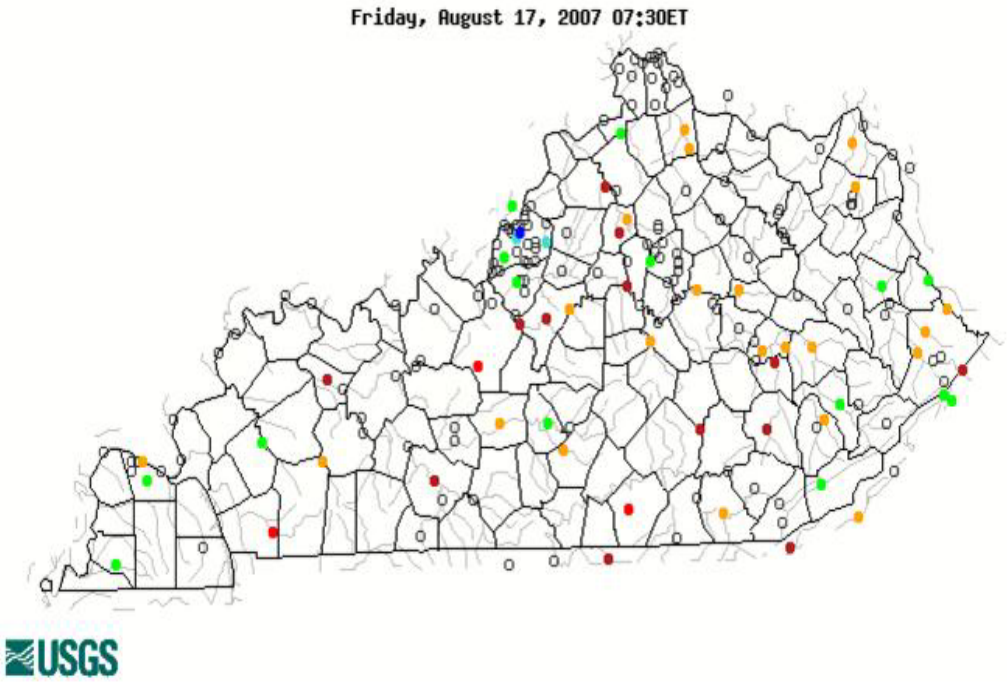


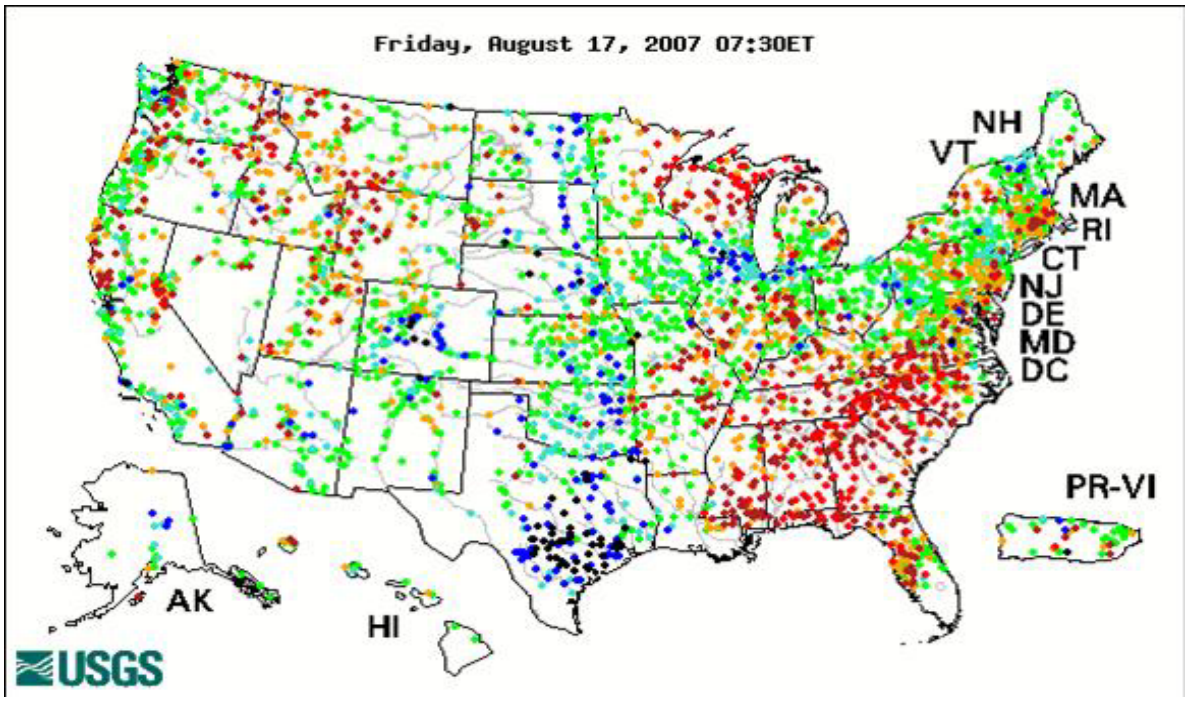
Short-term outlooks from the Climate Prediction Center continue to indicate below normal chances for precipitation during the next two weeks. Outlooks for the next one to three months indicate equal chances for below-normal, normal and above-normal rainfall for the state.

Hydrology

STREAMFLOWS

The U.S. Geological Survey maintains a real-time stream gauging network that monitors flows in all major river basins in Kentucky. Measurements of streamflow are a very good indicator of the longer-term hydrologic impacts of drought. During the developing stages of drought, streamflows provide valuable information on the severity and regional extent of emerging problems. Streamflow data is evaluated relative to the long-term record to determine drought intensity and identify potential problems associated with water shortages. Once a drought has matured, streamflow measurements are critical at many locations where water withdrawals have the potential to cause adverse environmental impacts to streams.





New Updated Aug. 17, 2007 New

Effects from the previous month's precipitation have diminished and August streamflows across most of the state are in a steady decline. All river basins contain streams that are experiencing flows categorized by the United States Geological Survey as "much below normal" (less than a 10 percentile for the period of record). Little River at Cadiz, Green River at Paradise, Nolin River at White Mills and Beaver Creek near Monticello all indicate flows that are all-time lows for this day in their period of record.

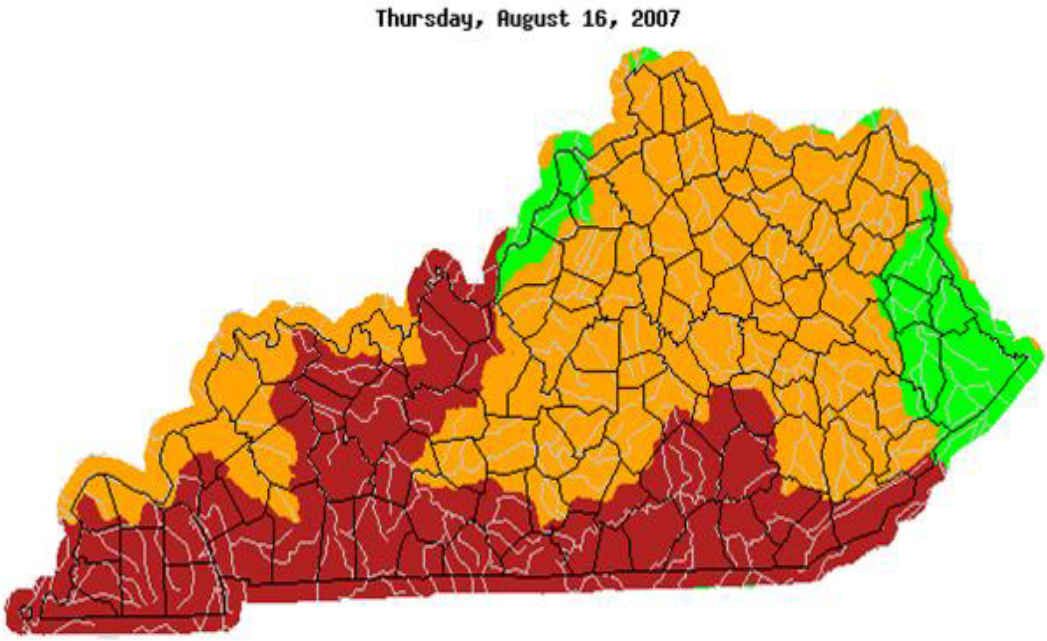
With abnormally high temperatures and below-normal rainfall forecast to continue, current severe low flows are expected to persist and become more widespread.

Weekly and Monthly Streamflow

For a slightly longer-term perspective of streamflow conditions across Kentucky, the United States Geological Survey computes average flows for the previous seven, 14 and 28 days. The resulting average streamflow values are categorized relative to the long-term record and assigned levels of severity based on the frequency that similar magnitudes of low flow have occurred in the past. By averaging over a period of several days to several weeks, the values on the map are more indicative of longer-term conditions than daily average or real-time streamflow measurements.

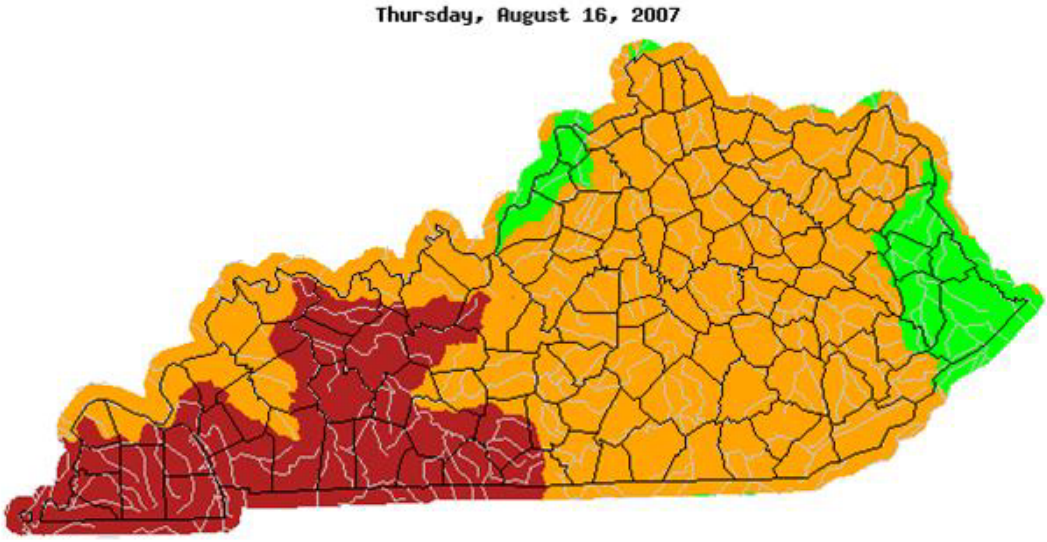
Updated Aug. 17, 2007

Seven-Day Average Streamflow

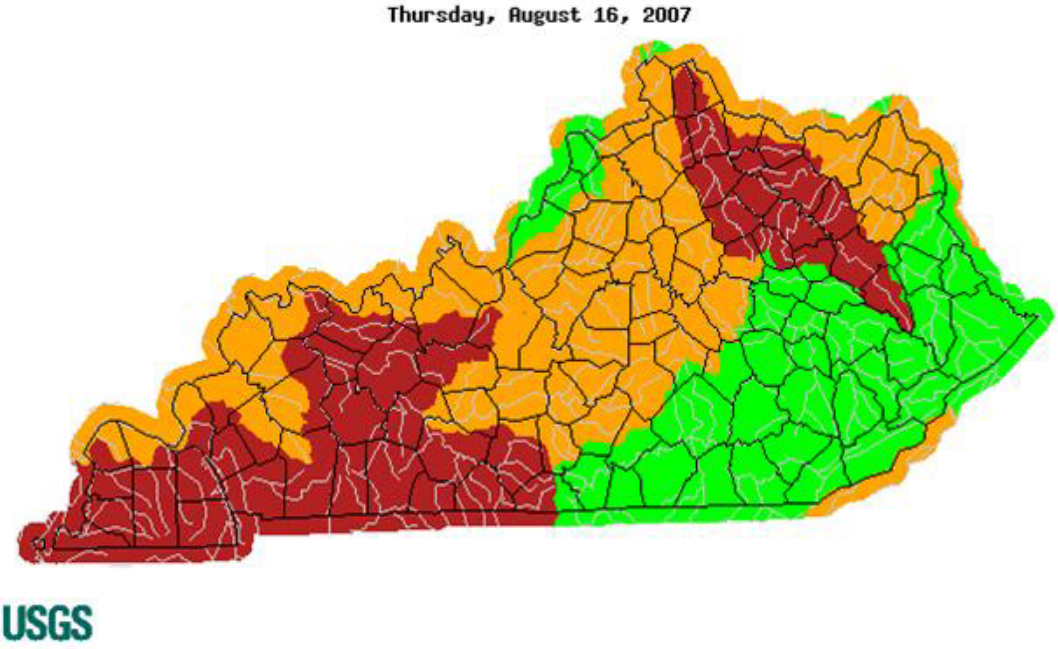


USGS

14-Day Average Streamflow



28-Day Average Streamflow



The 28-day average streamflow is still indicating that flows are significantly below normal in the Licking, lower Green and Lower Cumberland River basins as well as throughout the Purchase. Elsewhere, long-term flows remain below normal in the upper Green, lower Kentucky, Tradewater, Salt and Little Sandy river basins.

Normal 28-day flows are observed in the upper Kentucky, Upper Cumberland and Big Sandy river basins.

Lakes and Reservoirs
U.S. Army Corps of Engineers Projects

Another useful measure of the impact that drought is having on a region is the status of area lakes and reservoirs. The Division of Water monitors data from 12 projects operated by the U.S. Army Corps of Engineers (USACE) from three USACE districts: Louisville, Huntington and Nashville. These projects strive to maintain reservoirs at pool levels consistent with the operating guidelines as part of the larger mission of flood control and navigation in the Ohio and Mississippi rivers. Beginning in April, the releases from the reservoirs are managed to allow filling to the "normal summer pool elevation." Significant precipitation deficits in the basin above the reservoir can adversely affect the attainment of normal summer pool elevation. This, in turn, may result in low flows in the river below the project when releases from the reservoir are reduced to the minimum needed for water quality and aquatic habitat.

By examining the data for "current pool elevation" and "current outflow," valuable information about the status of large headwater areas above the USACE reservoirs can be obtained.

New Updated Aug. 17, 2007 New

United States Army Corps of Engineer Reservoir Information
Updated Aug. 16, 2007

August 16, 2007

Basin	Project	Current Outflow (cfs)	Normal Summer Pool Elevation (ft)	Current Pool Elevation (ft)
Little Sandy	Grayson	25.2	645	643.0
Big Sandy	Dewey	27.2	650	650.7
	Fishtrap	76.3	757	757.0
	Yatesville	23.8	630	629.5
	Paintsville	11.8	709	708.8
Licking	Cave Run	50.0	730	729.6
Kentucky	Carr Creek	5.0	1027	1027.2
	Buckhorn	40.0	782	782.0
Salt	Taylorsville	32.0	547	544.9
Green	Green River	49.0	675	674.9
	Nolin	49.0	515	515.3
	Barren River	53.0	552	548.1
	Rough River	50.0	495	494.6

As of Aug. 16, 2007, reservoir levels remain below the normal summer pool elevation at Taylorsville Lake in Spencer County, Barren River Lake in Barren County and Grayson Lake in Carter County. It is noteworthy that both Barren River and Rough River lakes have been at or near the minimum release since mid-March, further evidence that the current drought conditions have been under development for some time.

Small Lakes and Water Supply Reservoirs

The Division of Water will monitor selected small water supply reservoirs when conditions indicate that water supplies may be threatened by persistent drought. While many small water-supply lakes are not abnormally low, they continue to decline under the stress of high temperatures and lack of precipitation. Increased customer demand has forced a number of these water systems to call for conservation measures.